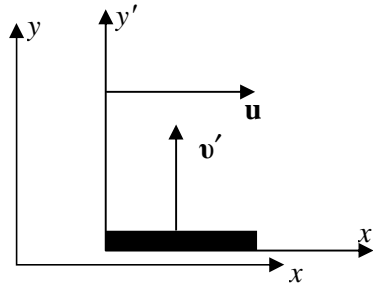# PHYS2100 Tutorial 1

**Problem.1.1** In $S'$ reference frame (moving with velocity $u$) a rigid rod parallel to $x'$ axis moves in the $y'$ direction with velocity $\upsilon'$. Calculate the angle between the rod and the $x$-axis in the reference frame $S$.



**Problem 1.2.** A particle moves along a straight line. $x = \upsilon_x t; \quad y = \upsilon_y t$. Find the particle trajectory in the standard primed reference frame. Find the angle $\theta$ between the radius-vector of the particle and the $x'$-axis.

**Problem 1.3.** Prove that for any two particles with 4-velocities $\mathbf{V}_1$ and $\mathbf{V}_2$ the scalar product $\mathbf{V}_1 \cdot \mathbf{V}_2 = \dfrac{c^2}{\sqrt{1 - u^2/c^2}}$, where $u$ is the velocity of one particle relative to the other.